KNOWLEDGE

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I SCIENCE

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SCULPTURE (part two)

THE five centuries that followed the downfall of the Roman Empire are known to us as the Dark Ages. We know little of the history of this time, and few examples of its sculpture have survived. The discoveries of the classical Greek sculptors were

A 7th-century Lombardian bas-relief

not, however, altogether lost, but were preserved in the simplified forms of Byzantine art. These eastern works may appear stiff and formal compared with the life-like forms developed by the Greeks themselves; but notice, for example, in the illustration on the left, how the folds of the drapery still display the artist's knowledge of the human form beneath the material.

Detail of a 10th-century Byzantine bas-relief in ivory (Stroganoff Collection, Rome)

European art in the 12th century was greatly influenced by such Byzantine works; their rigid, solemn compositions were imitated in the style we know as Romanesque. But within a hundred years an entirely new spirit could be seen; once again it became the concern of sculptors to represent life. We see this first in the sculpted decorations of the great French Gothic cathedrals. Then, by the second half of the 13th century, the Italian sculptors, too, began to turn their attention to the classical models. Nicola Pisano (about 1220–1284) and his son Giovanni are sometimes called the fathers of modern sculpture. Their work shows a rejection of Byzantine formulae, and they began to study carefully old Roman statues and sarcophagi. The Pisani are particularly famous for their sculptured pulpits at Siena and Pisa, which show a new awareness of the human form.

The Adoration of the Magi (detail from the pulpit in the Baptistry at Pisa by Nicola Pisano). *Notice the new roundness and solidity of the figures*

Figure of the Madonna in ivory, by Giovanni Pisano (Pisa)

Detail from Orcagna's Tabernacle, in a Florentine church (14th century)

The Renaissance

In the early 15th century the greatest centre of artistic activity was Florence. Architects and painters were looking for their inspiration to the models and ideals of Ancient Rome, and with sculpture, too, a new spirit was apparent. The greatest sculptor in this exciting time was Donatello (about 1386–1466). One of his most famous works is the marble statue of St George, which shows a young man standing firmly on the ground, alert and

Head of St George (detail from the statue by Donatello)

Previous page: Michelangelo's *Pieta* in the Castello Sforzesco Collection, Milan. He was working on this unfinished masterpiece in the last three days of his life. Behind: Michelangelo (from a self-portrait).

KNOWLEDGE NEWS

Week beginning 9th June 1963

The curious cross enclosed in a circle which was carved on the wall of St Mary's Church.

BLACK MAGIC

FOR OVER 1,000 YEARS THE BLACK ARTS HAVE DISTURBED THE PUBLIC AND RECEIVED THE ATTENTIONS OF THE STRONG ARM OF THE LAW.

The five-hundredweight gravestone which was recently moved near St Mary's Church, Clophill.

A 17th-century engraving showing the ace witch-finder, Matthew Hopkins, investigating various witches and their imps. Hopkins's success in discovering witches was widely thought to have been the result of his capture of one of the Devil's own lists.

THE little village of Clophill in Bedfordshire became, a few months ago, the centre of Britain's attention. The ruins of the 500-year-old church of St Mary had been visited, and the bones of a young woman, buried in 1770, rifled from a tomb. They were found carefully arranged on the floor of the church with the skull fixed on an upright spike.

The intruders had first unsuccessfully tried to open the graves of six other women. At the seventh they were successful. They prised open the five-hundredweight slab of the tomb, and climbed eight feet down to the coffin. Later it took all the combined efforts of four burly policemen to move the slab back into place.

A strange sign consisting of a curiously carved cross enclosed in a circle was carved on the wall, and painted red.

The desecration was discovered when a young couple strolling near the church saw a boy with the skull. The police were summoned. They concluded that Clophill had been the scene of some sort of black magic ceremony. There were some people, however, who thought the whole thing was the work of hoaxers.

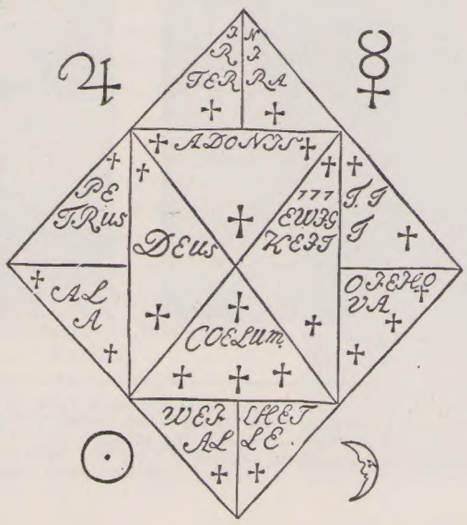
The fuss about Clophill has now died down, and the bones have been reinterred. But it has caused many people to wonder how widespread black magic is in Britain.

We know for certain that it exists. We most often hear and read about the charlatans who like the publicity that association with witchcraft brings them. Black masses, however, do occur. These are little publicised, although often very serious affairs, being genuine Devil worship.

Yet black magic and witchcraft are today taken much less seriously than they once were. As late as the 17th century the government were extremely disturbed by the practice of witchcraft.

In the years 1645–1647 the government-sponsored witch-hunter, Matthew Hopkins, secured the execution of no less than 200 witches. People believed that his success was the result of his capture of one of the Devil's own lists of witches.

* * *



A secret diagram which was said to have been used to raise and control all evil spirits. It was regarded as most powerful in invoking the spirits' aid in finding lost treasure.

* * *

Britain's kings had throughout the Middle Ages shown a particular interest in witchcraft. In the 11th century Canute had passed a law ordering banishment or death for all witches, wizards, or soothsayers. In 1419 Henry V had his step-mother, Joan of Navarre, publicly proclaimed a witch. He claimed that she had made attempts on his life by means of black arts: to have 'encompassed and imagined the death of our lord the King by the most horrible means imaginable'. In 1441 the Duchess of Gloucester, wife of the Regent of England, was found guilty of magical practices. In the same century Richard III declared that King Edward IV and Elizabeth Grey had been brought together by witchcraft and sorcery. In 1483, when he was Protector, Richard declared in the Privy Council that his withered arm was the result of witchcraft. These accusations could well have been convenient ways of branding political enemies – just as in the United States, not so long ago, accusations of Communism were frequently used as a political weapon.

However, the Tudor monarchs showed great concern about witchcraft. In 1542 the first Tudor act against witchcraft was passed; incantations, conjurings, and witchcraft designed to kill, maim, or destroy property were all penalised. A similar act was passed by Elizabeth I.

An attempt to kill James I by witchcraft was made by the Earl of Bothwell. After it, James became convinced of the power of the black arts. In his book *Demonologie* he states his conviction that the forces of darkness can be contacted by human agencies. He notes that 'many honest and merry men practise charms'. This is not witchcraft, he considers, yet he is sure that the Devil can be raised by 'conjured circles'. The Devil, he thinks, attracts his disciples by making them glory in 'the empiring over him'.

James I was one of the most intelligent of British monarchs, and many today would accept his verdict.

Letter from the Editor

37 HERTFORD ST.
LONDON W.1

I HEARD a rather interesting talk on the radio the other day. It was all about fashions in young people's clothes. Apparently all those fashion-conscious boys who spent large sums on drain-pipe trousers and winkle-picker shoes have had a bit of a shock; for these fashions are definitely on the way out. Instead they must start spending their money on trousers with bell-bottoms and on chisel-pointed shoes.

It was rather startling to learn how much some young people spend on clothes; often far more than they can afford. The advantage of saving to buy clothes rather than buying, say, cigarettes and chocolate is that clothes last a long time. But if out-of-fashion clothes are just as unwearable as worn-out clothes, or as uneatable as eaten chocolate, then I think someone is being made a fool of somewhere; and it is not those who make the fashions who are being fooled.

Fashions in clothes used to be confined to a small class of people. In the days of Beau Brummel fashion was a sort of hobby. Now the majority of people are fashion-conscious. Moreover, fashion is no longer a hobby but highly commercialised. When the sales of one type of clothing show signs of dropping, there are always inventive minds to produce and publicise new fashions.

John Chancellor

Reminder for readers of
BLUE Knowledge

Still available from your newsagent

The Standard Binder for Volume 2

See your newsagent right away! The standard binder for Volume 2 holds issues Nos. 13–24, and costs 3s 6d. It is the same as the binder you got free with your first volume. If you have any difficulty in obtaining this binder, write to Department B, Knowledge, 37 Hertford Street, London W.1. There is an extra charge of 1s 3d on each order from this department. However, on orders of more than one binder, the extra charge is still only 1s 3d.

This announcement does not apply to Easibinder collectors.

INSTANT SKELETONS

Skeletons for export – plastic models from the Educational and Scientific Plastics Factory go to more than 40 different countries.

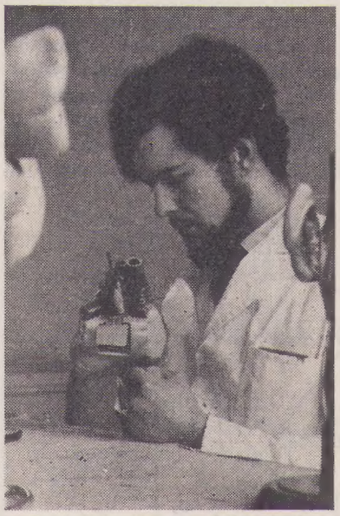
FOR SALE! One skeletorso *complete with* 206 *bones and many easily dismantled human organs, including heart, brain, lungs, and intestines. The whole in handsome plastic, in tasteful realistic colours – yours for* only £112*! Too much? Well, what about the plain skeleton – no organs, of course, but great value at* £34 10*s.*

Skeletons are of great use in the study of medicine. Bodies left to the medical profession have always been welcomed. India, Mexico, and South Africa all at one time exported skeletons. But the ghoulish trade is beginning to become less; in South Africa the supplies have been curtailed with the introduction of free burial for paupers.

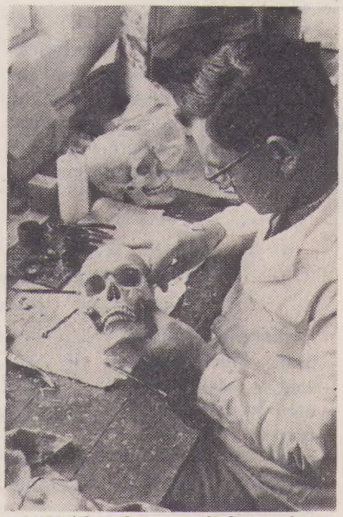
Anyway, human skeletons were never cheap, and rarely perfect. Furthermore, dead bone is not very durable. However, in 1950 a breakthrough was made in the skeleton problem. The world's first plastic skeleton was produced in a basement in Croydon, Surrey. With its realistic appearance, its strength, and absence of the deformities often found in human specimens, it was at once acclaimed.

Since then the industry has expanded to such an extent that recently a new factory was opened specifically to meet the growing demand. More than half of the skeletons are sent to over 40 countries. The majority go to the United States and the major Commonwealth countries, although consignments have gone to The Faroes and North Borneo.

Skilful hands assemble the plastic fingers.



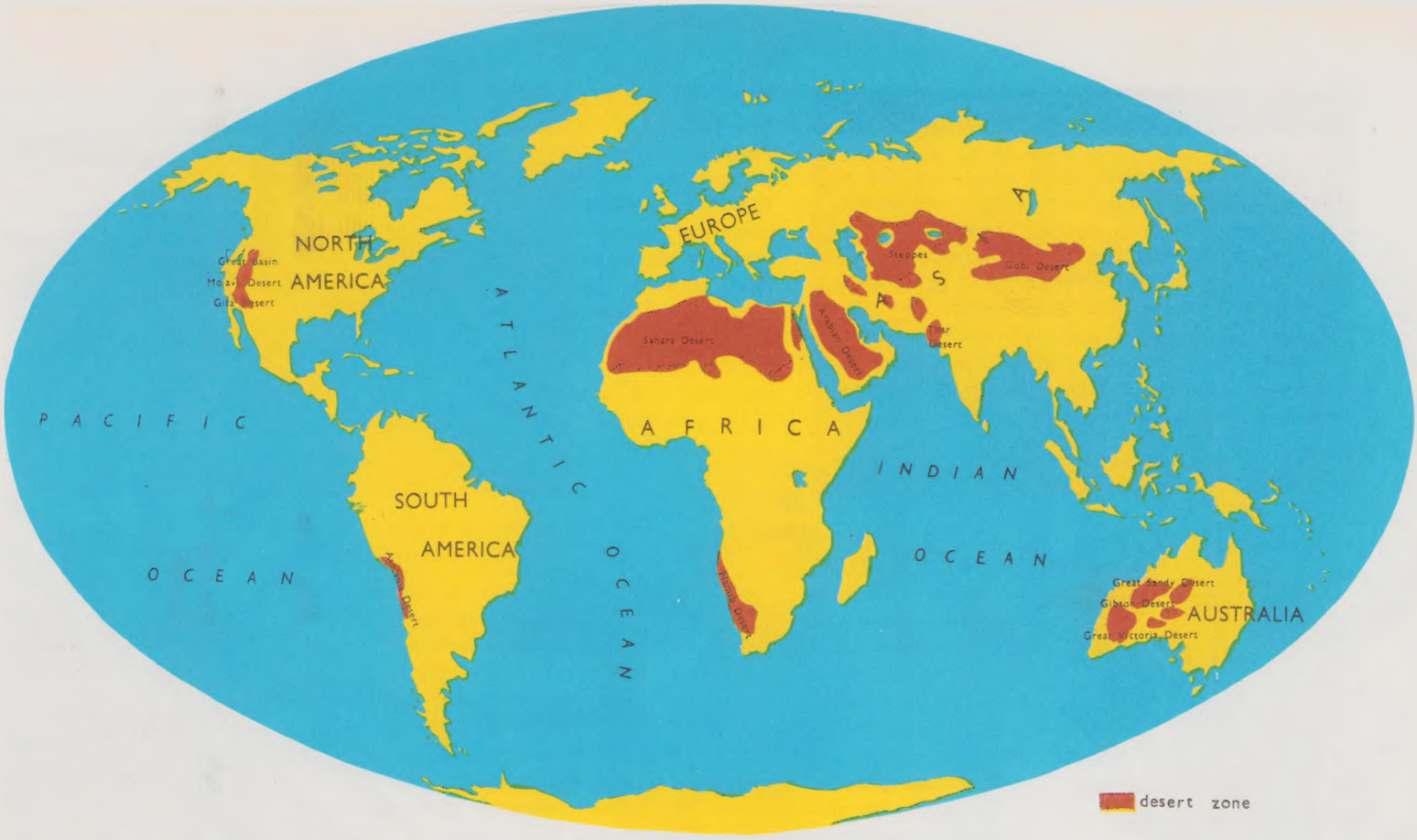
An artist paints one of the plastic hearts.



A skilful craftsman articulates a jaw.

The finishing touch for one of the instant brains.

Have you ever owned a teddy bear? The name Teddy is a nickname for Theodore, and the toy derived its name from Theodore Roosevelt, a President of the United States. He had a passion for game hunting, especially bears. American cartoonists played this up, and he was often portrayed with a small pet bear. An American doll maker saw possibilities in this, and in 1903 persuaded a German toy manufacturer to produce a toy bear made of brown plush. He named it 'Teddy's bear'. It was an immediate success, and teddy bears were soon to be seen all over the world.



PLANTS OF DESERT REGIONS

WE have already given an account of animal life in deserts (see page 1308), showing how various animals are adapted to living in very dry regions. Adaptation to desert conditions is also seen in plants, which have even more need of it because they cannot travel in search of water as animals can. Most desert plants have structures which enable them to reduce the loss of water by transpiration or evaporation through their leaves (see page 1505), and many of them can store water for long periods in their tissues. Savannah and steppe are also very dry, and similar adaptations are seen in plants of these regions (see page 1985).

DIFFERENT KINDS OF DESERTS

The popular idea of a desert is of a limitless expanse of sand, but not all deserts are like this.

The deserts of Africa, Arabia, Iran, and much of Australia are mainly sandy, but most of the American deserts are rocky. Great areas of the Asiatic deserts between Mongolia and the Caspian Sea have a surface of dried mud.

All of them have one feature in common: very low rainfall and so a shortage of water. Their plants are therefore always *xerophytic* in character – that is, adapted to extremely dry conditions. We shall classify desert into these three types: mud, sandy, and rocky, and give examples of the sort of plants that grow in each of them.

The mud desert

In the Gobi Desert of Mongolia there are vast stretches of dried mud or clay, highly impregnated with salt. The reason for this is that the little water which does fall as rain is removed by evaporation, so that salt accumulates in the soil instead of being washed away by streams and rivers.

The plants living here have to be adapted to salty conditions as well as to drought, so the vegetation is extremely sparse – a little grass and small thorny bushes.

Thorny bushes, and a little grass, are the only plants found in the mud desert

PLANTS OF THE SANDY DESERT

The most characteristic woody plants are thorny bushes. These are mostly low-growing, and the thorns give them protection against browsing animals. Coarse, fibrous grass is also found, and so are plants with very thick, leathery leaves, which are adapted to store water and to avoid the loss of it through their surfaces. Although the date palm grows in sandy deserts, it only does so in places where water is present under the sand at no great depth. The plants shown on this page are typical of sandy desert.

Note: In these illustrations the plants are not drawn to the same scale.

WELWITSCHIA MIRABILIS – Found in the deserts of south-western Africa, this plant is famous as a botanical curiosity. It is very slow growing and lives for at least a century.

Welwitschia mirabilis

Xanthorrhoea hostilis

XANTHORRHOEA – This is the grass tree, a characteristic plant of the dry regions of Australia. It has a short, thick trunk from the top of which rises a tuft of grass-like foliage and a flower stalk bearing a long, straight inflorescence. It yields a resin that is used in making varnish.

Date palm

Acacia senegal

ACACIA SENEGAL – This is a low-growing, thorny bush with pinnate leaves made up of numbers of small leaflets. When it rains, pretty white flowers quickly appear at the bases of the leaves. An important commercial product, gum arabic, is obtained from this bush, which is found in the desert and dry savannah country of northern Africa.

Aristida pungens

ARISTIDA PUNGENS – This plant, which is one of the Graminaceae or grasses, grows in tufts on the dunes of sandy deserts. Its root system may stretch more than 50 feet away from the plant.

Aloe succotrina

ALOE – These plants have the same appearance and mode of growth as the American agaves (see next page), though they are not closely allied to them. The leaves are thick and leathery, and the flowers are borne on a tall central stalk.

DATE PALM (*Phoenix dactylifera*) – In the sandy deserts there are some places where water is present at quite a shallow depth under the surface. Such a place is known as an oasis, and in the oases of the North African and Arabian deserts the date palm is a characteristic plant. It is a large tree, growing to a height of 60 to 80 feet and bearing a crown of large, feathery leaves. Human existence in these deserts is largely dependent on the fruit of the date palm.

PLANTS OF THE ROCKY DESERTS

Typical rocky deserts are found in the western part of the United States, and their characteristic plants are the cacti. They belong to the type of plants known as succulents; their leaves are converted to spines and their stems are greatly enlarged and thickened. The stems are green and carry out the function of photosynthesis (usually performed by the leaves), and they also act as reservoirs to store water, which is absorbed on the rare occasions when it rains. As in the case of desert bushes like the acacias, the spines serve to protect them against browsing animals.

Barrel cactus

BARREL CACTUS (*Echinocactus grusoni*) – An almost globular species of cactus that grows to nearly 3 feet across, and has interlacing yellow spines 3 inches long. The small red flowers are borne on the top of the plant. It is common in the American deserts.

PRICKLY PEAR (*Opuntia ficus-indica*) – The stems of this cactus are flattened and look like large, fleshy leaves with tufts of sharp spines growing on them. The flowers are yellow and the fruit is edible. A native of America, this plant is now widely distributed.

Prickly pear

Cereus giganteus

OPUNTIA ERINACEA – On the rare occasions when there is rain in the desert this cactus bears beautiful, rose-coloured flowers. It is allied to the prickly pear.

Opuntia erinacea

CEREUS GIGANTEUS (or *Carnegiea gigantea* as it is sometimes called) is the largest of the cacti and grows to 70 feet in height. It is a native of the hot deserts of the south-western United States, and is a characteristic feature of the scenery of this region. The fruits are green and contain a red pulp which is edible; the flowers are yellow. The plant varies somewhat in appearance, and we show two specimens, of which the right-hand one is in flower.

OTHER COMMON PLANTS

Other plants often found in the American deserts include the agaves and the yuccas. Although not closely related, they have the same habit of growth – a rosette of tough, spiky leaves growing from a stem at ground level, and a tall central stalk bearing the flowers. *Agave americana* is called the century plant because it flowers at very long intervals.

When it rains numerous short-lived plants spring up in the desert, among them the sand-verbena and the desert dandelion.

Agave americana

Yucca

Verbena

Cereus giganteus

Desert dandelion

THE GREEK THEATRE

THE Ancient Greeks, who were the first people in Europe to have a highly developed civilisation, were also the first to produce plays. Dramatic performances in fact played an important part in many religious festivals.

All the Greek plays which survive today were written to be performed at dramatic competitions held in Athens. These took place in honour of the god Dionysus (also called Bacchus), who besides being god of wine was also god of the theatre.

Tragedy and comedy

All Greek plays, whether tragedy or comedy, were written in verse throughout.

The plot of a tragedy was nearly always a well-known myth or legend: the interest to the audience lay in exactly how the dramatist handled his plot. The three great tragedians were Aeschylus, Sophocles, and Euripides, who all lived at Athens in the 5th century B C.

Comedy, however, used plots invented by the dramatist. The 'Old Comedy' of the 5th century B C was more like a modern television variety show than a play: the plot was quite loose, and the comedy was a riotous satire, very often political, of a particular idea or person. Aristophanes, for instance, satirised the idea of political rights for women, the philosopher Socrates, and the politician Cleon, all with amazing freedom of speech.

The 'New Comedy' of the 4th and 3rd centuries B C was the forerunner of the modern domestic comedy. Its greatest dramatist was Menander, whose plays were later adapted in Latin for Roman audiences by Plautus and Terence.

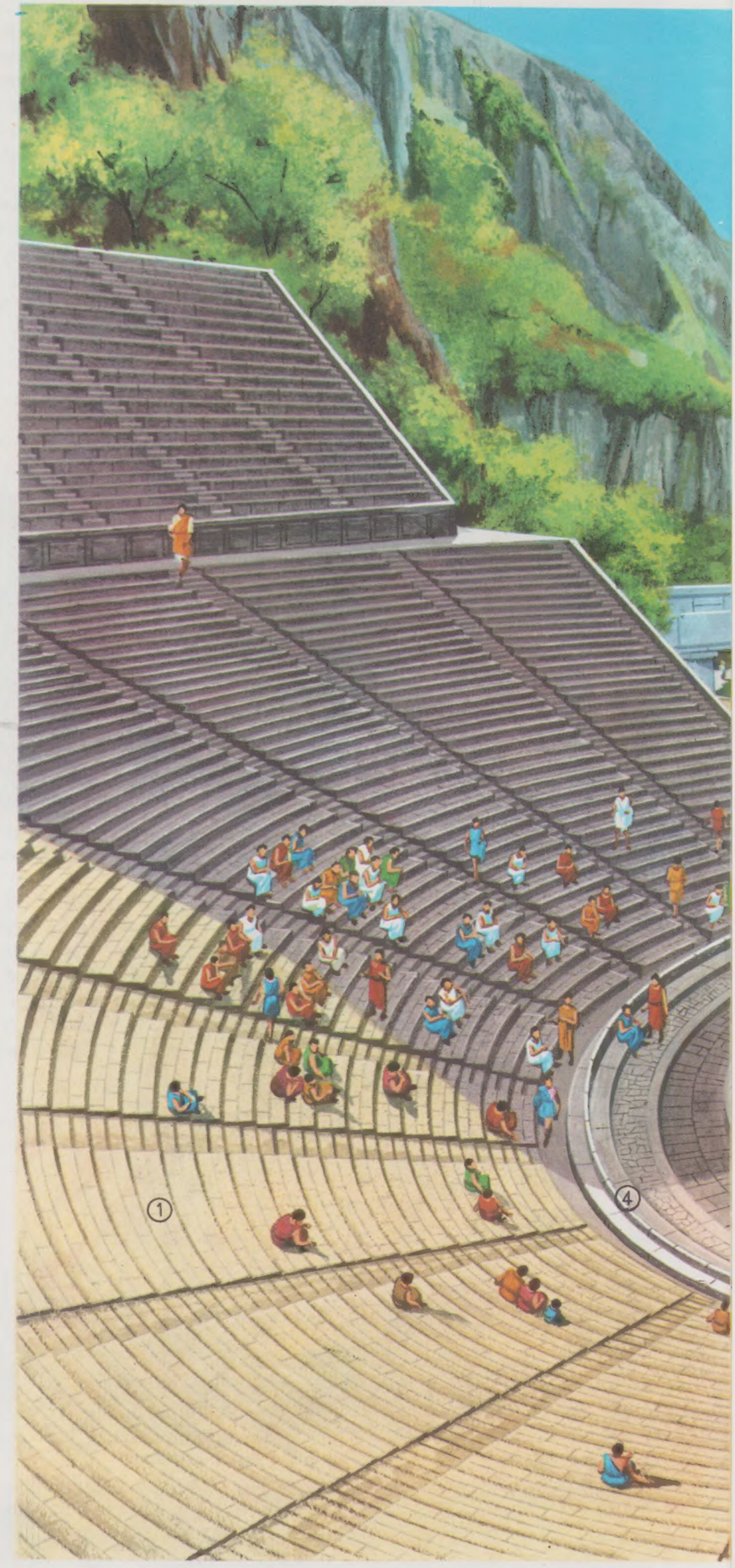
The Chorus and the actors

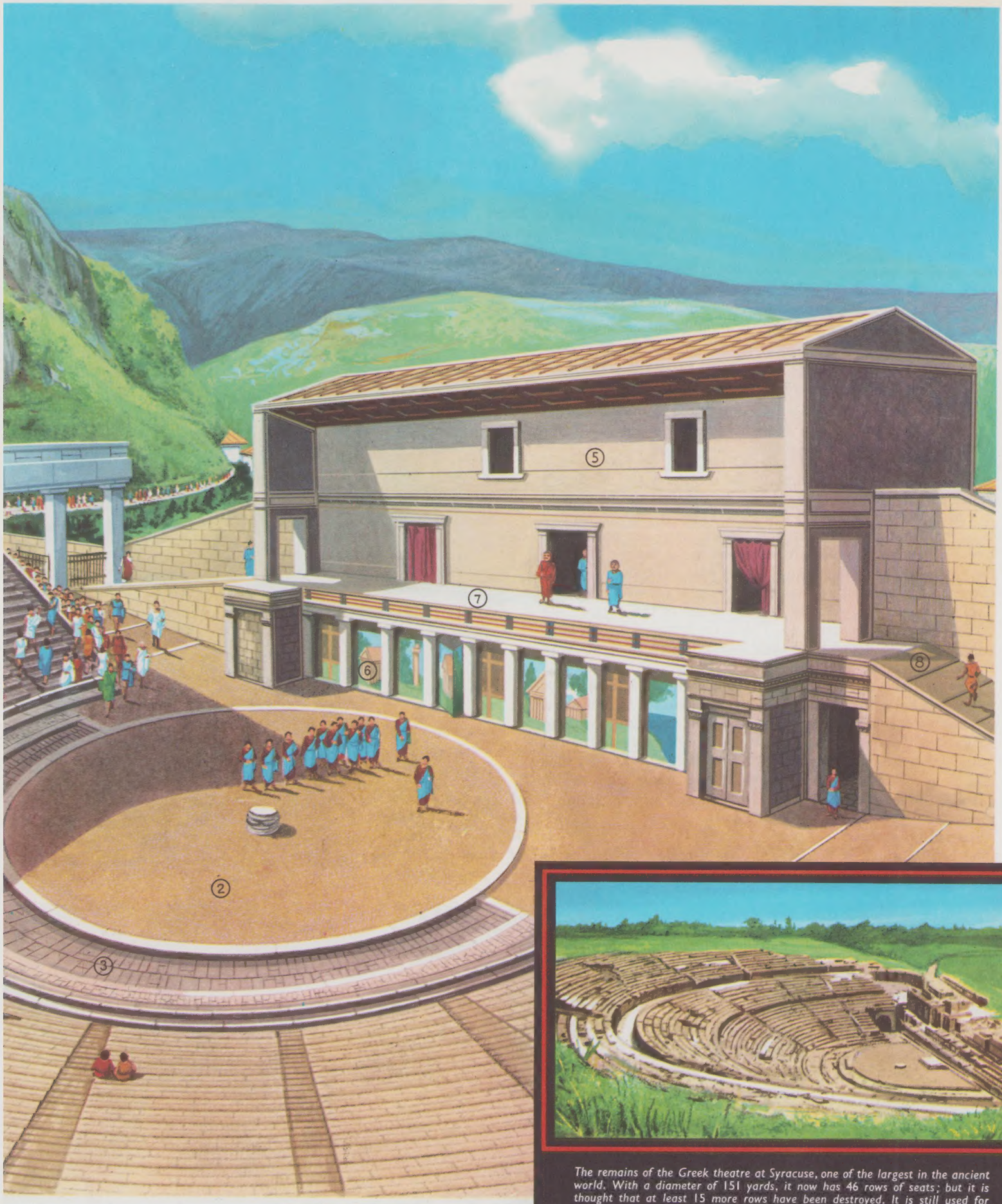
An important feature of both Tragedy and Old Comedy was the Chorus of 12 (or, later, 15) singers who also danced in the *orchêstra*, the circular dancing-floor in the middle of the theatre. The Chorus in its lyric songs would comment on the dramatic situation. It also spoke advice to the characters. Drama, in fact, originally developed from dialogue between the Chorus and a *hypokritês*. This Greek word, originally meaning 'the answerer', came to mean 'actor' (hence the modern word 'hypocrite', someone who pretends to be other and better than he is). Aeschylus introduced a second actor, and Sophocles a third.

The Greek theatre at Epidaurus

The big picture on the right shows a reconstruction of the Greek theatre at Epidaurus. This is the finest in Greece, and the best preserved anywhere. As is usual with Greek theatres, it is built on a hillside in the open air, and its acoustics are wonderful.

① There are 55 semicircular rows of stone seats without backs, giving room for more than 7,000 spectators. ② The *orchêstra*. ③ Gutter to collect the rain. ④ The front row of seats (with backs) for the magistrates and important visitors. ⑤ The *skênê* – the permanent background to the action. ⑥ Columns supporting ⑦ the *proskênion*, or stage proper. The Greeks used very little scenery. ⑧ Ramps leading up to the *proskênion*.





The remains of the Greek theatre at Syracuse, one of the largest in the ancient world. With a diameter of 151 yards, it now has 46 rows of seats; but it is thought that at least 15 more rows have been destroyed. It is still used for performances of ancient Greek plays

TUNISIA

TUNISIA lies on the Mediterranean coast of Africa. It can be roughly divided into three regions: the north, which is mountainous and well watered; the south, which is part of the Sahara Desert; and the centre, which is more varied, being mountainous in the west and flatter in the east.

The north

In the north-west are the Medjerda and Kroumirie mountains. These are well watered, especially on the northern slopes, where there are dense forests of cork oak. In the cooler parts grow trees such as the ash and the elm. On the southern slopes the forests are replaced by grain fields, and some of the most fertile land in Tunisia is found in this region. The river Medjerda connects a number of old lake basins, the deep soils of which are particularly good for the cultivation of cereals. In the east, around Bizerta and Tunis, and in the neighbourhood of Cape Bon, the land is flatter and a great variety of crops is grown, including grains, oranges, lemons, olives, vines, tobacco, almonds, and vegetables.

The central region

This region includes the area to the north of the great Chotts and the Gulf of Gabes, and to the south of the Medjerda valley and the Gulf of Hammamet. In the west the mountains rise to 5,066 feet at Djebel Chambi. There is enough rainfall here for forest growth, and the higher areas are covered in trees. There is much pasture land, and in the valleys the olive flourishes and grain is grown. Further east is the steppe, which consists of a number of low ridges with a very dry climate. Trees can only grow in the highest areas of the steppe, and cereal crops must be irrigated. This is the home of the nomadic tribesmen, who depend for their livelihood on their flocks of sheep and camels.

The coastal strip, about 10 to 15 miles wide, is known as the Sahel and has a comparatively dense population. Although the annual rainfall is less than 16 inches, olive trees grow without irrigation. This is made possible by heavy dews and water lying just below the soil. The villages, especially around Sfax and Sousse, are surrounded by millions of olive trees, which provide the main crop.

The south

The south, which is the Sahara Desert region of Tunisia, is very dry, and has an annual rainfall of less than four inches.

A Tunisian oasis. The date palms growing round it provide one of Tunisia's most important crops

IMPORTS
Sugar, petrol, coal, machinery, textiles.
EXPORTS
Grain, olive oil, phosphates, wine, dates, iron ore, lead, and citrus fruits.
TUNISIA

Apart from a few favoured localities, the south is virtually uninhabited. Settlement is mainly confined to the shores of the great Chotts and to Gabes. A chott is a salt-water lake. The largest in Tunisia is the Chott el Djerid (1,900 square miles in area), which lies 52 feet below sea level. Dates are the chief crop of this region, and enough are grown to allow a surplus for export. The date palms are grown where underground water supplies are available, mainly around Chott el Djerid and Gabes. Some of the smaller oases are constantly threatened by moving sand, and screens have to be built to protect them.

Industry and mining

The most important industries in Tunisia are the canning of fruit juices, fish, and vegetables, the manufacture of soap and perfume, and the production of superphosphates and cellulose. The textile industry is also being developed.

Looking across the Gulf of Tunis from the city. The white buildings are typical of North African towns

City dwellers produce a variety of goods in their own homes or in small workshops, among which are leather goods, carpets, copper ware, and pottery. Factories are being built to make similar articles.

The chief mineral resource is phosphate, over two million tons of which are produced each year. About a million tons of iron ore and about 35,000 ounces of silver are mined each year, and so are a little lead, zinc, and lignite.

FLORA AND FAUNA

The natural vegetation of Tunisia varies with the rainfall. The wettest areas, in the north-west, have a dense growth of oak, ash, elm, chestnut, wild apple, and plum trees. The Aleppo pine is the main tree in the higher parts of the interior, while in the east there are many wild olives and various shrubs. The only plants which grow in the desert area are those which are adapted to withstand drought.

Elephants once lived in Tunisia, but they became extinct in Roman times, while bears died out at the beginning of the 20th century. The lion is almost extinct, but the leopard, cheetah, hyena, jackal, wild pig, and lynx survive, and the wild goat is common. Among the birds found here are the eagle, pelican, heron, cormorant, duck, and flamingo. There are several varieties of tortoises and snakes, and many lizards.

The cities

Tunis, the capital, has a population of over 700,000, and is by far the largest town in the country. It is built on an isthmus (neck of land) between two salt lakes. The old native Arab quarter, known as the Casbah, is a huddle of narrow streets in the higher part of the city. The modern town, much of which was built by the French, has huge blocks of tall buildings and wide, straight boulevards, and makes a contrast to the older quarter. Tunis is the chief industrial centre. Foodstuffs are processed and various kinds of textiles are made.

Sfax is the second city of Tunisia, although it has only 70,000 inhabitants – one-tenth the population of Tunis. It has gained its position from its activities as a port, and is the centre of the olive-oil industry.

Kairouan, with 40,000 inhabitants, is a holy city for Muslims and is one of the most interesting cities in North Africa. It has no less than 23 mosques, one of which dates from the 11th century, and is surrounded by an imposing town wall.

FACTS AND FIGURES

Area:	48,300 square miles
Population:	4,250,000 inhabitants
Form of government:	Republic
Religion:	Islam
Capital:	Tunis
Language:	Arabic; some French and Italian are also spoken

AGRICULTURE AND FISHING

The chief cereal grown is wheat, of which some 500,000 tons are harvested each year. Barley follows, with about 200,000 tons, but very little maize is grown, because the climate is too dry. Olive oil is an important export, and some 70,000 tons are produced each year.

Tunisia produces about 31 million gallons of wine each year. Dates, almonds, oranges, and lemons are other important crops, together with esparto grass. A country as dry as Tunisia naturally has more sheep (3,000,000) and goats (one and a quarter million) than cattle (500,000). There are 200,000 camels, but only 150,000 horses. About 13,000 tons of fish are landed; chiefly tunny, sardines, and mackerel. About 125 tons of sponges are collected each year.

Sponges are collected at the port of Sfax

LEONARDO DA VINCI AS AN ENGINEER (part two)

LEONARDO DA VINCI was a man of many talents: besides his artistic genius, his notebooks indicate that he was also a mathematician, a chemist, a geologist, a botanist, an astronomer, and a geographer. It is less surprising that he was able to pursue his scientific interests when one considers that only about 12 paintings can be attributed to Leonardo with any degree of certainty, and he probably only painted some 25.

One of his principal interests was weapons of war. This was in some ways a curious preoccupation for one who referred to war as 'the most bestial madness', but Leonardo justifies his interest in military machines in his notebooks. Recognising that there is a difference between 'offensive' and 'defensive' warfare, he noted that it is necessary to prepare for the latter as a safeguard against the former. 'When besieged by ambitious tyrants,' he observed, 'I find a means of offence and defence in order to preserve the chief gift of Nature, which is liberty.'

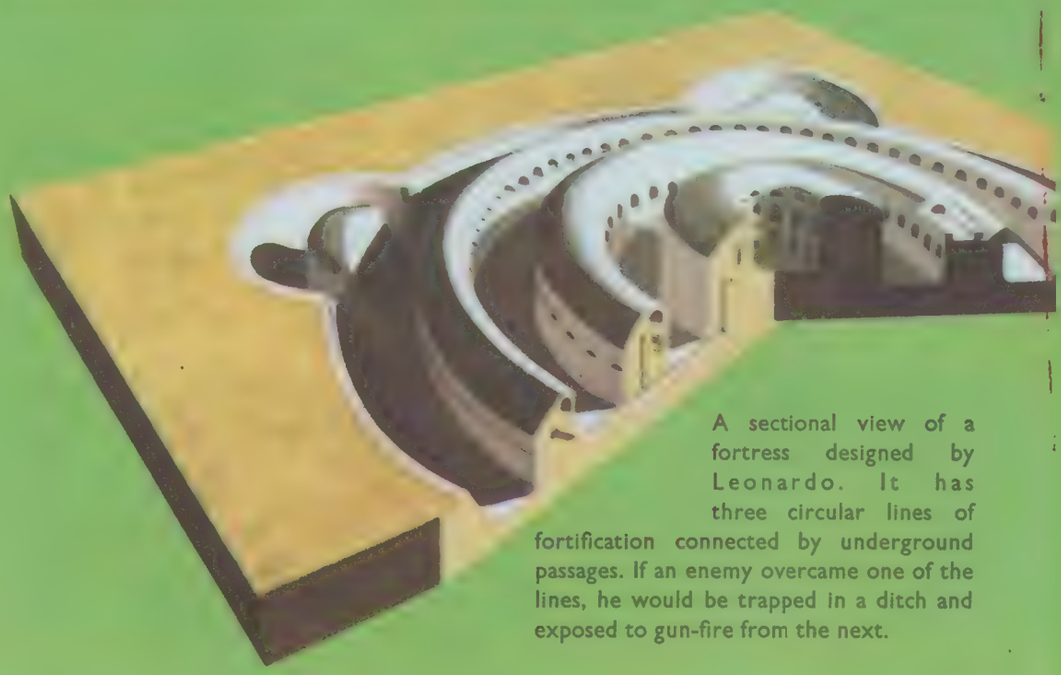
Almost all of the most characteristic developments of the First World War (those which distinguished it from preceding wars) were prophesied in precise detail by Leonardo da Vinci. He saw the tank as 'taking the place of the elephants. One may tilt with them. One may hold bellows in them to spread terror among the horses of the enemy, and one may put carabiniers in them to break up every company'. Leonardo also foresaw the use of poison gas and even gave a formula for its manufacture and described how a mask could be used as a protection. The aeroplane, of course, was one of his major interests, and will be discussed later. He also envisaged a submarine, but did not reveal how it might work in case this information should fall into the wrong hands.

It is extraordinary that so many of these inventions did not come into practical use until about 400 years after Leonardo's death, but this was the fate of most of his more unusual ideas – to be disregarded by his contemporaries. But these contemporaries tended to feel, not awe at his talents, but regret that he should have wasted time on his scientific studies which could have been spent on painting. It is only comparatively recently that it has been realised how wrong they were.

LEONARDO – CONTINUAL INNOVATOR

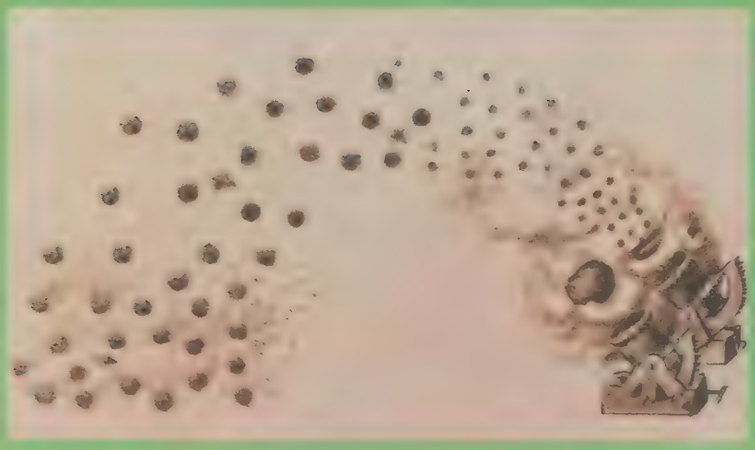
A study of Leonardo's notebooks – and they consist of about 5,000 pages – might suggest that he produced designs for machines of practically every type imaginable. It is true that he did invent many radically new mechanisms, but one should not try to claim for him complete originality in everything that he seemed to have discovered. He was friendly with other men who were doing research in similar fields at the same time, and from them he might have got many of his ideas. He tells in his manuscripts that he obtained information from every possible source – although not from the astrologers, whose wisdom he considered on a par with that of the alchemists (see page 2079). But he usually improved on existing machines in some way or other, if he did not actually invent them himself.

Leonardo invented a great many devices for use in metal-working: machines for rolling and hammering, as well as wire-gauges and furnaces for melting metal. Leonardo spent much time on this work while employed by Ludovico Sforza. On the right is a furnace with a guided flame.

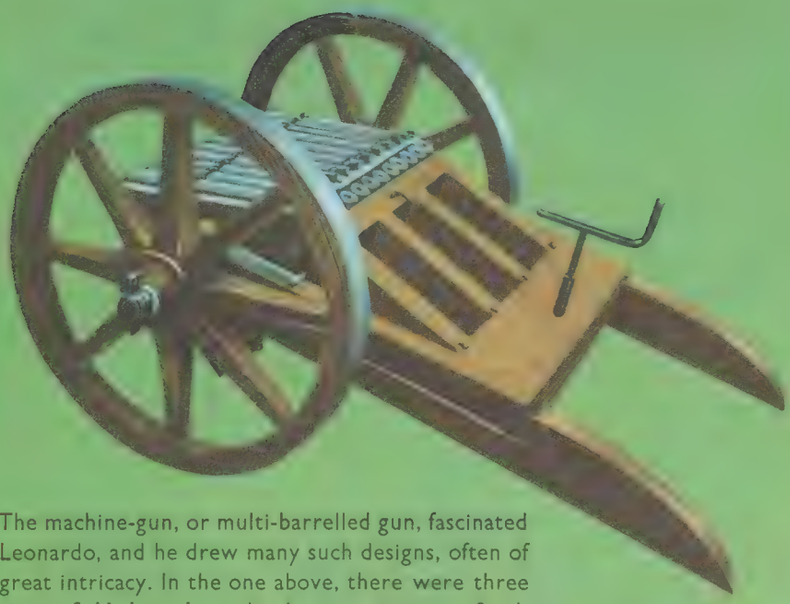


A sectional view of a fortress designed by Leonardo. It has three circular lines of fortification connected by underground passages. If an enemy overcame one of the lines, he would be trapped in a ditch and exposed to gun-fire from the next.

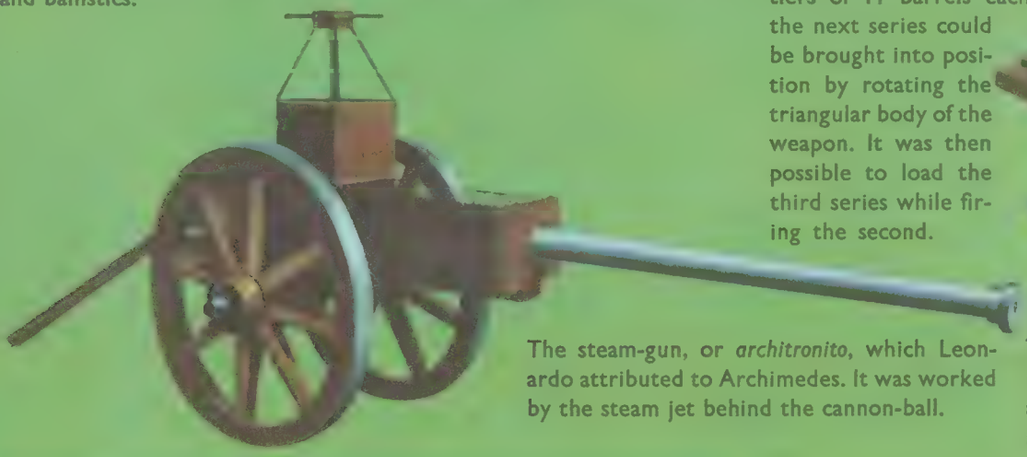
Leonardo was particularly interested in the problems of warfare during two periods of his life; from 1482 until 1499, when he was at the court of Ludovico Sforza, ruler of Milan, and in 1502 and 1503, when he was military engineer and adviser to the infamous Cesare Borgia. His employers would have been almost invincible if every one of his designs could have been used.



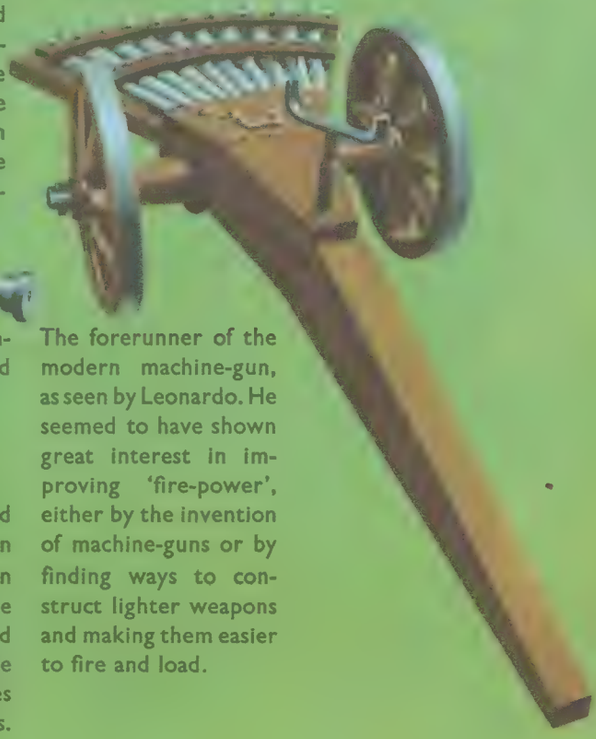
The mortar was but one of many types of gun invented by Leonardo. Several of his drawings, such as the one above, illustrate intensive aerial bombardments. He made a detailed study of gun-construction and ballistics.



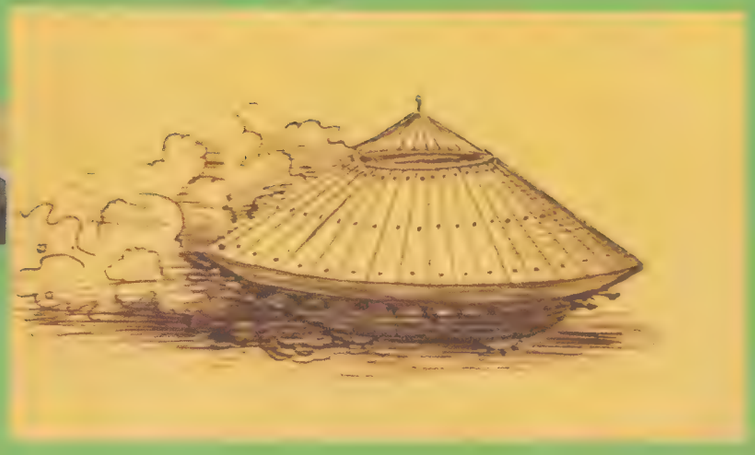
The machine-gun, or multi-barrelled gun, fascinated Leonardo, and he drew many such designs, often of great intricacy. In the one above, there were three tiers of 11 barrels each. As one tier was fired, the next series could be brought into position by rotating the triangular body of the weapon. It was then possible to load the third series while firing the second.



The steam-gun, or *architronito*, which Leonardo attributed to Archimedes. It was worked by the steam jet behind the cannon-ball.

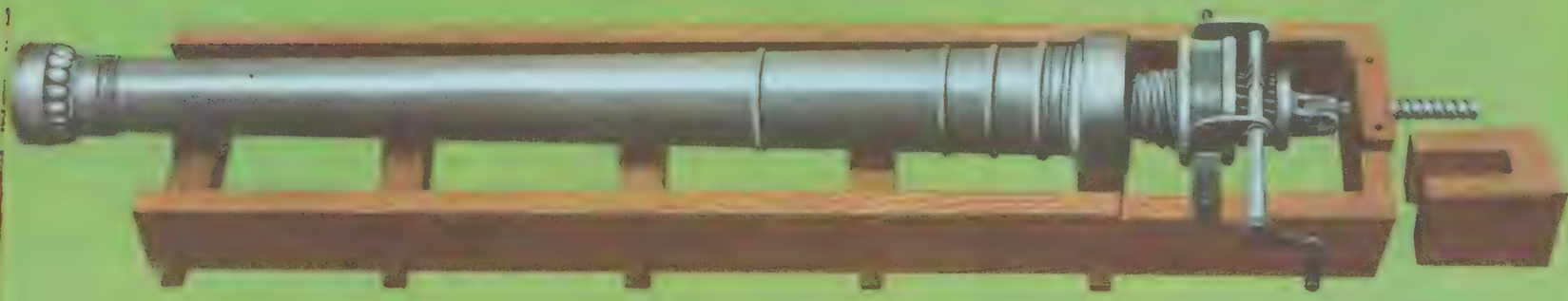


The forerunner of the modern machine-gun, as seen by Leonardo. He seemed to have shown great interest in improving 'fire-power', either by the invention of machine-guns or by finding ways to construct lighter weapons and making them easier to fire and load.



Leonardo's armoured car, or tank. The gun barrels can be seen projecting from the side. It was moved along by men inside who turned handles fixed to the wheels.

Leonardo da Vinci not only wrote down instructions for the casting of gun barrels, including the relative dimensions for different types of weapons, but also invented the wheel-lock for breech-loading. His machine consisted of a bronze plate which was pushed on to the breech of the gun by a rotating screw connected, through gearing, with the handle. This device did not, of course, come into general use for some years.



SOME SEAPORTS OF THE WORLD

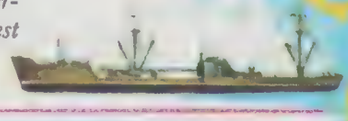
IT is through her shipping that a country transports her goods to overseas markets, benefiting her own economy and supplying vital products to other countries. The centres of the shipping trade are the great seaports.

The greatest seaport in the world is New York. It was started as a fur trading post by the Dutch under the name of New Amsterdam in the 17th century. Ships of all kinds from cargo boats to transatlantic passenger liners, flying flags of every nation, pass through the port of New York.

New York owes much of its importance to its position on the Hudson river, close to the Atlantic Ocean. The port is also linked to the Great Lakes and St Lawrence Seaway through canals.

On an average more than 1,000 ships a month visit New York, and over 40 per cent of America's foreign trade is handled by the dockyards. Important exports are machinery, vehicles, grain, meat, copper, and woodpulp.

New York Harbour. New York is the commercial capital of the United States and the largest seaport in the world



Liverpool (U K) lies on the river Mersey. 23 million tons (1960)

Vancouver (Canada) handled 12 million tons (1960)

New York (U S A) on the mouth of the Hudson river. 85 million tons (1961)

Boston (U S A), on the Atlantic Ocean. 20 million tons (1960)

Newport News (U S A) handled 15 million tons (1960)

San Francisco (U S A) has one of the world's best sheltered harbours. Ships entering this cosmopolitan port pass under the Golden Gate Bridge, which spans the Strait of the Golden Gate. Handled 25 million tons (1961)

The port of London is the third largest in the world. Built on the banks of the Thames, it stretches from Tilbury to Teddington, although seafaring ships can only go upstream as far as London Bridge because the river is too shallow beyond. There are five main dock systems. Tilbury is a passenger shipping terminus. The port handled 53 million tons (1960)

Norfolk (U S A) is on the Atlantic seaboard and has one of the best natural harbours in the world. It is a naval dockyard base, and exports sea food, coal, tobacco, and cotton. 20 million tons (1960)

Los Angeles (U S A) 25 million tons (1961)

Newcastle-upon-Tyne (U K). 3 million tons (1961)

Bremen (W. Germany). 15 million tons (1960)

ALMOST A THOUSAND MILLION TONS A YEAR

This enormous figure is the average total amount of goods transported by merchant fleets throughout the world in a year.

In the old days of sailing ships, ports were more plentiful and smaller, one reason for this being that vessels took longer to reach their destinations, and the crews needed to replenish their

Hamburg (W. Germany) covers an area of 29 square miles on the estuary of the river Elbe which drains into the North Sea. It is one of the 'free' ports of the world where foreign goods can be stored for any length of time in warehouses, free of customs duty. The port has an excellent network of communications to countries such as Switzerland, Hungary, Austria, and Czechoslovakia. Hamburg also ships goods through the Kiel Canal to and from Scandinavia. Handled 29·9 million tons (1961)

Rotterdam (the Netherlands) is the second largest port in the world and the leading port of the Netherlands. Built on the river New Meuse near its estuary into the North Sea, Rotterdam mainly deals with heavy goods like coal, iron, and steel. It also trades in food products, clothing, and petroleum, and has excellent communications with inland countries by means of roads, canals, and railways. Handled 90·5 million tons (1961)

Antwerp (Belgium) has over the centuries become one of the most important seaports of Western Europe. Built on the estuary of the river Scheldt, 55 miles inland from the North Sea, it has excellent communications by road, rail, and waterway with other countries. Handled 38·6 million tons (1961)

Yokohama (Japan) is Japan's largest trading port. It handled 18·2 million tons (1958)

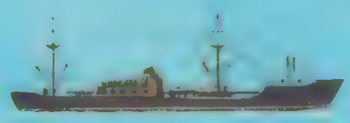
Genoa (Italy) handled 22 million tons (1960)

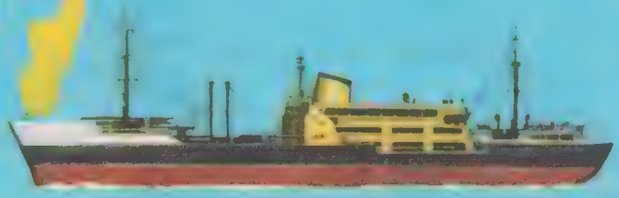
Le Havre (France) is the main seaport of France. Handled over 16 million tons (1960)

Kobe (Japan) handled 6 million tons (1958)

Marseilles (France) is France's chief Mediterranean port, trading mostly with North Africa and east Mediterranean countries. Situated in the Gulf of Lion. 33 million tons (1960)

Valencia (Spain) at mouth of the river Turia. Figures unobtainable





supplies more frequently, because they were not able to store as much food as in modern ships. Docking techniques were not so specialised in the age of sailing ships.

Today ports of call must be able to dock ships of all sizes. Because modern vessels are, on the whole, larger than sailing ships, they need deeper water when being navigated to or from their berths. When one talks technically about this, one refers to the 'draught' of a ship, which is the amount of water the ship needs to move in. Bigger ships have a draught of up to 35 feet when fully loaded, while the small trader can navigate with a clearance of about 15 feet.

A port is a junction between land and sea transport. It is also one of the lifelines of a country, so trade tends to be centred in a few geographically accessible areas. Efficient communications make it possible for vast quantities of materials to be transported inland, while inland products can be conveyed speedily to the port. Such communications can be divided into three categories: road, rail, and water.

In some ports the part played by water communications is most important. Bremen, for example, is linked to the German industrial centres by a system of canals which form a quick and cheap route for the transport of bulk cargoes like coal, ores, and grain. In other ports road and rail networks play the more prominent part. Genoa transports goods not only to the big industrial cities of Milan and Turin but also to the Italian Alps and Switzerland.

The amount of cargo handled at each port depends a great deal on its size, and it is interesting to compare the figures given for each port mentioned in this article.

ROALD AMUNDSEN

Portrait of Roald Amundsen at the time of his expedition to the South Pole

ROALD AMUNDSEN, the celebrated Norwegian polar explorer, was born in 1872 and died in 1928. His name is chiefly remembered because he led the successful Antarctic expedition which first reached the South Pole, but this was only one of the many expeditions to Polar regions in which he took part. He was a member of the first scientific expedition ever to winter south of the Antarctic Circle. He was the first man to navigate the North-west Passage, and he also sailed through the North-east Passage. Later he flew over the North Pole, and he finally lost his life when flying from Norway to Spitsbergen to assist in the rescue of the survivors of the ill-fated *Italia* airship expedition of 1928.

It was originally intended that Amundsen should become a doctor. Although he took a degree at Oslo University in 1890, he never completed his medical training, for he went to sea at the age of 22. For some years he served his apprenticeship on whalers. This was good experience for the sort of work which he was to do later, and, indeed, he was only 25 when he was appointed as first mate of the *Belgica* for the Antarctic expedition led by A. de Gerlache. The *Belgica* sailed from South America to the South Shetland Islands, and during the summer season of 1897–1898 cruised along the west coast of Graham Land. During 1898 the ship was beset by pack ice in the Bellingshausen Sea, and she drifted throughout the winter in the southern part of this sea. This was the first time that men had spent a winter south of the Antarctic Circle.

THE NORTH-WEST PASSAGE

In the 16th and 17th centuries, explorers such as Frobisher, Davis, Hudson, and Baffin made many voyages in an attempt to discover a sea route from the Atlantic Ocean to the Pacific Ocean, passing to the north of Canada. It was then realised that this must lie between the numerous islands and peninsulas of the Canadian archipelago where the sea ice is often thick throughout the summer.

During the 19th century, many attempts were made to sail by this route, culminating in the ill-fated Franklin Expedition of 1845 and the numerous relief expeditions until 1859. But no ship had actually sailed through the North-west Passage until Amundsen accomplished this in the tiny sealer *Gjøa* between 1903 and 1906. Because the North Magnetic Pole is situated in this part of the Arctic (see page 367), the study of terrestrial magnetism was one of the objects of the expedition.

The voyage of the Gjøa through the North-west Passage

The ship spent two winters at the small harbour called Gjøa Haven on King William Island, which is close to the Magnetic Pole. During this period, Amundsen spent many months sledging along the east coast of Victoria Island learning from the Eskimos their technique of travel and (which was to prove most important for his later polar journey) their methods of handling dogs. Amundsen spent a third winter (1905–1906) at King Point, in Mackenzie Bay, and the *Gjøa* finally sailed through Bering Strait into the Pacific Ocean in the summer of 1906.

Amundsen with his four companions on their march to the South Pole. The dogs which

A CHANGE OF PLAN

The successful voyage of the *Gjøa* established Amundsen as one of the outstanding polar explorers of his generation. His next goal was the North Pole itself, an expedition based upon the repetition of Nansen's daring technique of drifting across the Arctic Ocean in his celebrated ship *Fram* (see pages 1310–1311). Amundsen's plans for this new venture were far advanced when, in 1909, Peary (see page 593) reached the North Pole. Amundsen therefore decided to make this an Antarctic expedition which had the sole object of attaining the South Pole. Although it was part of his new plan to reach the pole in December 1910, it was, in fact, one year later that he succeeded in doing so.

Amundsen did not make his intentions public until August 1910, after the expedition had sailed from Norway. At the same time, Captain Scott's expedition was also on its way to Antarctica (see page 1408). Like Scott, Amundsen approached Antarctica from the Ross Sea, to reach the edge of the Ross Ice Shelf at the small indentation known as the Bay of Whales. Here Amundsen chose the site for 'Framheim', his winter quarters. The same site was later used by Admiral Byrd and other American explorers.

THE SOUTH POLE

From Framheim the route to the South Pole crosses three quite distinct kinds of country. First there are about 470 miles of almost horizontal shelf ice to be crossed to the foot of the great escarpment of the Queen Maud Range. The journey through these mountains is about 160 miles, with a climb to the Polar Plateau at about 9,000 feet. However, Amundsen's route up the Axel Heiberg and Devil's Glaciers involved much descending as well as climbing. It is a very difficult and dangerous route to the plateau. The last stage of the journey on the surface of the plateau is between 280 and 300 miles. Amundsen depended upon dog teams to pull his sledges. The British questioned the wisdom of this and both Shackleton and Scott preferred to use ponies on the shelf ice, followed by man-hauling on the glacier and plateau stages. Amundsen clearly demonstrated the superiority of dogs for such journeys. For example, on the Polar Plateau he was able to maintain an average of 18 miles per day, whereas Scott's polar party were seldom able to manage more than 12–14 miles.

pulled the sledges enabled them to travel quickly

The Norwegian flag planted at the South Pole

The only really difficult stage of Amundsen's journey was the ascent of the glaciers of the Queen Maud Range. Apart from the considerable dangers of crevasses and avalanches, his party experienced bad weather which made it difficult for them to find their way through these completely unknown mountains.

Amundsen and his four companions reached the South Pole on 14th December 1911. The return journey was made by the same route, and the polar party reached Framheim 99 days after their departure. The whole journey was about 1,860 miles long. The principal criticism which can be made of this expedition was that very little scientific work was done.

THE NORTH-EAST PASSAGE AND THE NORTH POLE

During the First World War, Norway was a neutral country, and Amundsen made a small fortune from shipping. He spent much of this money in having another Arctic ship built. This was completed in 1917 and named *Maud*. She was designed, like the *Fram*, to withstand the pressure of the polar pack ice, but *Maud* was slightly bigger than Nansen's ship. Amundsen's intention was to drift across the Arctic Ocean from a point north of Bering Strait towards Greenland. In order to reach the place where the ship should enter the pack ice, it was first necessary to sail through the North-east Passage between the coast of Siberia and the pack ice of the Arctic Ocean. Owing to a series of unforeseen circumstances, this voyage occupied the years 1918 to 1921, including three winters on the Arctic coasts of Siberia. The *Maud* therefore required an extensive refit at Seattle before the drift across the Arctic Ocean could be attempted. Although this voyage was accomplished by Captain Wisting between 1922 and 1924, Amundsen was not then with him.

ARCTIC FLIGHTS

Amundsen's last interest was in polar flying. His first attempt in 1922 to fly across the North Pole from Alaska to Spitsbergen was prevented by a landing accident. During 1923 and 1924 his flights northwards from Spitsbergen met with greater success, but it was not until 1926 that he crossed the Arctic Ocean and the North Pole.

Two years later, the Italian Nobile attempted to repeat the flight, but his airship crashed on the pack ice to the north of Spitsbergen. Although the survivors had a radio transmitter, it was several days before their distress signals were heard. A number of relief expeditions were sent and the survivors were eventually picked up.

But one of the relief expeditions was lost. This was Amundsen and his French pilot, who left Tromsø in northern Norway on 18th June 1928 to fly to Spitsbergen. They were never seen again.

Goethe's house in Weimar – when not writing Goethe took an active part in the government of the tiny state of Saxe-Weimar

GOETHE

THE years from 1750 to 1830 were among the most eventful in all European history. The age of Frederick the Great, which saw the beginning of this period, contained the seeds of the vast nationalist movement in Prussia which was to grow in scope and violence well beyond 1830 and indeed to extend its influence into our own times.

This was the epoch, too, of the French Revolution, with all the excitement that accompanied it and the disillusion that followed. It was the era of the Napoleonic Wars, and of the Congress of Vienna, that in 1815 reshaped the continent with effects that lasted into the 20th century. And 1830, indeed, was the year of yet another revolution in France.

It was during this turbulent period that there lived one of the greatest of all European writers – Johann Wolfgang von Goethe (1749–1832). His long life spanned all these tremendous events; he watched practically the whole development of modern Europe. And yet, in a strange way, he stood quite apart from it all. Despite the enormous range of his interests and his capabilities, despite his lasting effect on Europe's cultural development, he had no influence over the course of historical events: nor was he greatly influenced by them. Though a statesman himself on a small scale, as Minister of State in the tiny duchy of Saxe-Weimar, and though on one occasion he even met Napoleon, he was not particularly concerned with politics. Probably indeed at the meeting with Napoleon it was the latter who was more impressed – his comment afterwards has become famous: 'Voilà un homme!' (There's a man for you!)

How different Goethe's reaction was from that of his great countryman and contemporary, Beethoven (see page 337), much of whose most powerful music was inspired by the enthusiasm that the composer felt for the Napoleonic ideal. Perhaps the difference is connected with another great contrast between the two men: for while Beethoven's life was one of unrelieved poverty, illness, and unhappiness, Goethe was never troubled by material worries; and though he had his emotional upheavals he never wanted for money or comfort.

Goethe was a man of many parts. He was, as we have seen, a statesman. He was also, in his own way, a considerable scientist: he wrote, among other things, a monumental essay on granite, and he was, up to a point, a prophet of Darwinism (see page 1320), for though he did not hit upon the idea of evolution, he did realise that there is an ascending order of development among the various kinds of living creatures, arguing that each animal was created in turn as the level of development rose, with man as the last and highest.

But of course he was, above all, a creative writer. As such he ranks with Dante and Shakespeare as one of the great literary geniuses of Europe's civilisation. His writings, indeed, cover such a wide range both of forms and of styles that the best way to consider them is probably in relation to his life-story.

Early development

Goethe was born at Frankfurt-am-Main in August 1749. He was the son of a prosperous lawyer who had married a girl over 20 years his junior, but his social superior, being the daughter of Frankfurt's *Stadtschultheiss*, the equivalent of Lord Mayor. His father was a practical, orderly man, while it was his mother who gave him his artistic sensibility and his creative talent. These two contrasting inheritances are reflected throughout Goethe's work in the conflict between his classical and his more stormy romantic tendencies.

He was a precocious child. He had to study six languages,

Johann Wolfgang von Goethe, 1749–1832 – one of the world's greatest writers

and at the age of seven was already composing Latin dialogues. More significantly, at the age of seven he was also giving spirited performances of the story of David and Goliath with his own puppet-theatre. (At the same age, ten years later, the other great figure of German literature, Schiller, was dressing up as a parson and delivering sermons to his little sisters.)

Later he studied law at the University of Leipzig, and by now he was regularly writing poetry. At this time the prevailing influence in the German literary climate was the *Aufklärung*, or Enlightenment, often known as the Age of Reason.

Storm and stress

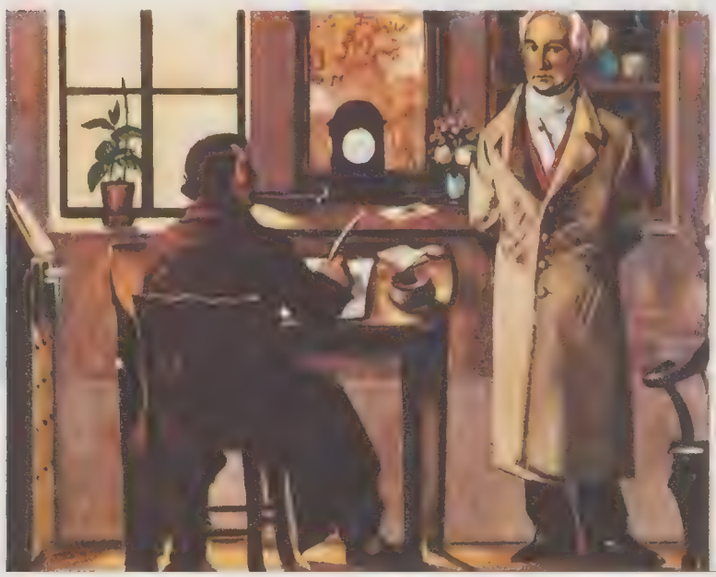
But at Strasbourg, where Goethe went to complete his studies, the influence of Johann Friedrich Herder brought him into contact with a new literary movement known as *Sturm und Drang* (Storm and Stress). This contact bore its first fruit when he returned home to Frankfurt in 1771 and, within a few weeks, wrote his first and stormiest play, *Götz von Berlichingen*. At the same time he was beginning to think about the subject that was to occupy him, on and off, for the rest of his life – the story of Dr Faustus, the scholar who sold his soul to the devil in exchange for the fulfilment of all his desires during his lifetime.

His next notable work was a novel, *Die Leiden des jungen Werthers* (The Sorrows of Young Werther). This was a highly romantic and passionate (and also extremely successful) book, based on his unhappy love-affair with a girl called Charlotte Buff. It was shortly after this that Goethe wrote the first draft of his great drama *Faust*. This version is known as the *Urfaust*, *Ur-* being a German prefix that indicates the original, unrevised version. At this stage the play was really only an ordinary tragedy, not the philosophical drama that it was later to become.

Goethe at Weimar

In 1775 Goethe moved to the court of Saxe-Weimar. Here he became a close friend of the young Duke, and it was not long before he was established in the government of the duchy, where he was to remain for a long time. Between now and 1779 he was immersed in this work, and he wrote little of importance apart from lyric poems, which flowed from his pen throughout his life and were perhaps always his most successful writings. 1779 was the year of *Iphigenie auf Tauris* (Iphigenia on Tauris). This play represented a change of style for Goethe: though it still contained the passion of his earlier works, the subject and form were classical, borrowed from ancient Greek drama.

Goethe dictating to his secretary – not for him the material hardships of many other great writers



Goethe in Italy – a brief escape from the provincial world of Weimar

In 1786 Goethe went on a journey in Italy. This was the most important single event of his life. It was his first escape for 11 years from the stifling atmosphere of Weimar, and it was also his introduction to all the delights of the ancient world that so far he had not known. On this journey he began *Torquato Tasso*, a severe poetic drama very much influenced by his experiences in Italy. He finished it after he returned to Weimar in June 1788.

Faust

There is now very little left to discuss of Goethe's literary works. Apart from a long novel, *Wilhelm Meisters Lehrjahre* (The Apprenticeship of Wilhelm Meister) and an idyllic poem, *Hermann und Dorothea*, there remains only one outstanding work, though that the greatest of them all, the completed *Faust*. Part I of *Faust* was published in 1808. This drama goes far beyond the economical and classical style of *Tasso* and indeed in many ways can be considered as one of the masterpieces of the romantic period. It contains the tragic story of the *Urfaust* within a broader setting of a wager between Faust and the devil's messenger that the latter cannot provide Faust with one single moment of real satisfaction. At the end of Part I he has not yet succeeded.

Part II is a very different kind of work, being more of a poem than a play. It is concerned much more with ideas and symbols than with characters. It is Goethe's greatest attempt to achieve what he had often tried before – the fusion of the classical and the modern in one work. It never quite shows whether the devil eventually succeeds in fulfilling his side of the pact – indeed it concerns itself very little with the pact at all – but in any case the problem is solved in the final scene when the angels come and take Faust up to Heaven.

The standard of Goethe's works varies to a remarkable extent between the sublime and the monumentally dull. This is true even within *Faust*, and is perhaps the consequence of his uneventful life, which led him to become more of a philosopher (though on a more practical level than his theoretically minded contemporaries like Kant and Schiller) than just a playwright, novelist or poet. Yet the sheer magnitude of his thought and his understanding compels us to place him without hesitation among the greatest of the world's literary geniuses.

Louis Kossuth speaking to a crowd of Hungarians, urging them to revolt against Austrian domination

THE STORY OF HUNGARY

HUNGARY lies in the centre of Eastern Europe. It is a country of mountains and plains, with the Danube river almost bisecting it. To the east of the Danube stretches the Puszta, a word meaning 'waste land'. It is a huge, rolling plain, wild in appearance even now, though some of it is cultivated. Its desolation is due partly to its lack of inhabitants, for the plain lies open and unprotected from invaders, and the Magyar people have never settled in large communities there.

There have been few countries so subject to invasion as Hungary. In earlier centuries, fierce nomad tribes swept across it, and in recent times it has suffered the attacks of modern mechanised armies. In spite of this history of continuous invasion, devastation, and persecution, the proud Magyar race of Hungary has never ceased to fight for its liberty.

Growth of the Hungarian state

Today Hungary is called *Magyarország*, the Magyar Republic. The name is derived from the Magyar tribes who occupied the country in the 9th century A D. They were a people of Finno-Ugrian origin from the Ural Mountains in Russia. Under their early kings, the Arpad dynasty, the Magyars became Christians, and built up a monarchy and feudal nobility modelled on those of western Europe.

In 1240 Hungary was invaded and laid waste by savage Tartars from the far east of Russia, but recovered, and in the early 14th century, under Charles of Anjou and his dynasty, became a strong country, whose boundaries included parts of Poland and Dalmatia.

Meanwhile the Ottoman Turks were threatening Europe, and Hungary proved a strong bulwark against them. The Magyar army was led by Janos Hunyadi, famous all over Europe as the champion of Christendom. He held the Turks at bay in a series of brilliant campaigns. On 24th January 1458, at a meeting on the frozen ice of the Danube, the nobles elected Hunyadi's younger son, Matthias Corvinus, as king, and during his reign Hungary enjoyed a period of peace and prosperity.

After the death of Matthias, the Turks took advantage of quarrels among the nobles to invade the country again, and in 1541 they captured and sacked Budapest, the capital. Gradually the country fell into the hands of the invading Turks; towns and villages were pillaged, and the people massacred. The Magyar-speaking people suffered most, and the population became very mixed, through the infiltration of Romanians, Croats, Serbs, and Germans.

Domination by Austria

In the following century Hungary was 'liberated' by the Habsburgs of Austria, but the new Austrian rule was little better for the Magyars. Though the Empress Maria-Theresa and her son Joseph introduced some reforms, the government of the Austrian Empire remained absolute and tyrannical. The Magyars were denied their own language and customs. Gradually a strong national resistance grew up, which burst into flood when a wave of revolution swept through Europe in the 19th century.

In 1848 Hungarian patriots, inspired by the revolts in France and Italy, called on their people to rise against the Austrian tyrants. Foremost among the country's leaders were the poet Sandor Petófi and the statesman Louis Kossuth.

But Hungary was not united in her struggle. The many different races within the country feared that the Magyars would dominate the new Hungary. The fight against Austria was weakened by the fact that the Croats joined the Austrians in invading Hungary to put down the revolt, and the Russian Tsar sent forces from the east to support the Emperor. Kossuth and many other revolutionaries fled. In 1867 the country was given a measure of independence, and united in the Dual Monarchy as Austro-Hungary.

In the First World War the Hungarians fought on the side of Germany against Britain and France. In 1920 Hungary gained her independence, but lost more than half of her territory, parts of which went to form the new states of Czechoslovakia and Yugoslavia, while Romania was given a part, and Fiume went to Italy. From 1931 to 1939, Hungary became pro-Nazi, modelled upon Hitler's Germany, and eventually entered the Second World War on Germany's side. In 1945 Soviet forces entered the country, and it became one of the People's Republics of the Soviet bloc, which it is today. A brief attempt at revolution in 1956 was put down by the Russians.

The geographical position of Hungary

FOCUS ON ISRAEL

Israel's army is truly a national one – even women are members. Here young Israeli girls undergo part of their rigorous training.

Jerusalem is a divided city; a signpost warns the young Israeli girl that the Jordanian frontier is ahead.

THIS year the state of Israel celebrates its 15th birthday. Although Israel is one of the world's newest states, its people have one of the longest of all recorded histories.

The Jews had already had an eventful and sometimes glorious past when they were turned out of their land by the Romans. Since then they have suffered exile, persecution, and, during the last war, an attempt by the Nazis to exterminate their race. Since 1948, however, over 1,500,000, from 70 countries, have arrived in Israel. Jews anywhere in the world have an inalienable right to Israeli citizenship. Today the population of Israel is 2,250,000.

The most striking thing about Israel is the tremendous enthusiasm with which its people are going about building up the new state. The land is being rigorously cultivated by collective farms, or *kibbutzim*. Attempts are being made to make parts of the burning Negev desert fertile. The vast potentialities of the Dead Sea are being exploited for industrial purposes.

Many of Israel's towns have a 'boom town' look. Building developments sprawl over the countryside, which up till now has changed little in thousands of years.

The Jews of old were farmers and warriors. The same is true of the modern Israelis. The rifles and pitchforks piled together symbolise the new Israel, which, to survive, must be able effectively to defend and cultivate its land.

The Israelis themselves have a feeling of 'togetherness', and pride in the building of their new state. An example of this togetherness is the army, which, if mobilised, would include the majority of the able-bodied population. Within 12 hours the nation could be in arms and marching into battle.

The Jews have also a tremendous pride in their language. Once Hebrew was like present-day Irish – few could speak it. Unlike Irish, however, its use has greatly increased in its native country, and to many it is now a mother tongue.

Yet Israel has also its problems. One of the greatest is the hostility of the four Arab countries ranged along its 600-mile land border, and which have a combined population of around 30,000,000.

The ancient city of Jerusalem is divided like Berlin; half belongs to the Arab state of Jordan.

But it seems that the energy and dynamism of Israel's people will surmount their difficulties, and provide the world with one of the most successful examples of high-speed state building in its history.

DID YOU KNOW?

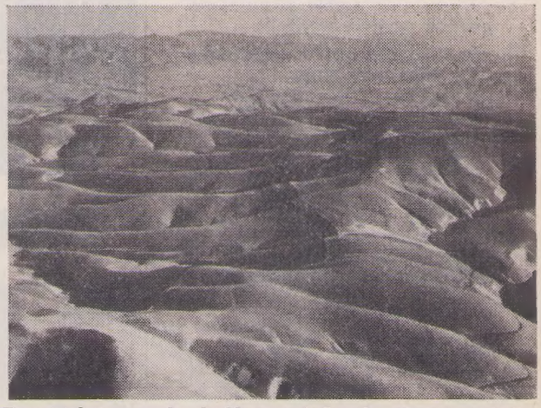
The invading Roman legionaries, who landed in Britain in 54 B C, reported seeing 'strange dogs which follow their prey into the ground'. They gave the dog a name, terrier, based on the Latin word for earth, *terra*. In the 17th century, fox-hunting became an organised sport, and this terrier breed was found to be quick-moving and able to keep up with the hounds. Today, breeds such as the wire-haired terrier are exported all over the world, and prices up to £1,000 have sometimes been paid for a single dog.

* * *

Church builders in the Middle Ages believed that the air was infested with devils and evil spirits, cast out by the coming of Christianity. So the masons, when building spouts to carry rainwater off the church roof, fashioned them into hideous monsters, with repulsive faces. These ugly gargoyles, it was hoped, would serve to frighten away the evil spirits.

* * *

If you smell gas, it is a warning that it is escaping from somewhere. The unpleasant smell of gas could quite easily be done away with, but the law will not allow it. If gas were odourless, escaping gas might not be discovered until too late. This could result in a serious explosion; or someone might die in bed if he did not smell it in time.



Desert takes up much valuable space in Israel – attempts are being made to make parts of it fertile.

To the Israelis the Bible is not only a religious work – it is also a manual of history, law, agriculture, and even warfare. In Jerusalem Zoo the animals, like Shaul the fox, have biblical inscriptions on their cages.

You write – thousands read!

In Memory

DEAR EDITOR—As I was looking through my old copies of *Knowledge News* I came across an article about making brass rubbings in No. 49. I was very interested, because brass rubbing is my hobby.

These brass memorials are a form of mediaeval art which show the costumes of the period. Not all brasses are knights or their ladies; many of them show ordinary people. The older brasses are of greater interest because they were very deeply cut, and able to last longer.

The oldest brass in England is in memory of Sir John Daubernoun at Stoke d'Abernon, Surrey, and dated 1277. The brasses of that period (1272–1400) were beautifully made, and are now quite rare. From then on the figures were drawn out of proportion on thin plates of cheaper metal, and the lines were obscured by excessive shading.

Collecting brass-rubbings is great fun, and you always have something to keep at the end. I would like to hear from anyone else who is interested.

John Gill (*age* 13),
21 *Friegland Road*,
Tunbridge Wells,
Kent.

Chinese Chow

DEAR EDITOR—I have lived in Hong Kong for eight years. I thought you might like to hear about some of the Chinese dishes we eat here. I have been to quite a few Chinese 'chows' and think that 'beggars' chicken' is one of the best dishes I have ever eaten. It comes onto the table baked in mud and leaves, and inside it is very tender. The waiter cracks the mud on the table. Then there are spring rolls; these are of pastry wrapped around special Chinese vegetables and meat. There is also sweet-and-sour pork, shark's fin, and birds' nest soup. To drink, there is usually jasmin tea and Chinese beer. There can be as many as 19 to 21 courses in a Chinese chow.

Deryn Fitch (*age* 12),
33/2 *Stanley Court*,
Stanley Village Road,
Stanley, *Hong Kong*.

Legend of the Lake

DEAR EDITOR—Here is another legend about Lough Neagh; this time about how it was formed. The story goes that a giant in England and a giant in Ireland were fighting each other. The giant in Ireland pulled a huge lump out of the ground and flung it at the giant in England. It missed, however, and fell into the Irish Sea. It is now known as the Isle of Man, and the hole in the ground that it left became Lough Neagh.

Eugene Gilligan,
43 *John Street*,
Waterford,
Ireland.

And Again

DEAR EDITOR—I can make a sentence with 13 consecutive 'ands' in it. 'Two men, Burland and Anderson, bought a shop and got a painter to print their names above the shop. The painter was not very good at printing, however, and he wrote: BURL AND AND AND ERSON. The men told the painter that there was too much space between the BURL and AND and AND and AND and AND and AND and AND and ERSON.'

J. A. Simpson (*age* 13),
72 *Greenbank Crescent*,
Edinburgh 10.

Curious Coal

DEAR EDITOR—I was recently putting some coal on the fire when I noticed some small pieces of a yellow substance among the coal. I searched among the rest of the coal and found some more of this rock. Being an amateur scientist, I was curious to find out what it was that I had found. I applied a flame to this yellow rock, and it burnt with a blue flame, giving off a pungent odour; this immediately told me that I had discovered some sulphur.

I have also found quite large quantities of sulphur pyrites in coal, and some greenish-yellow quartz. I have yet to find any fossils in coal, however.

Paul Wilson,
53 *Swarcliffe Road*,
Darnall,
Sheffield 9.

The Highest Mountain

DEAR EDITOR—Everest is the highest mountain in the world, above sea level. But the highest mountain from base to peak is Mauna Kea in Hawaii. It rises 32,000 feet from the floor of the Pacific Ocean, of which 13,780 feet are above sea level.

Stephen Barrett,
6 *Haslemere Road*,
Seven Kings,
Ilford, *Essex*.

Government Gold

DEAR EDITOR—I live in a gold-mining town, and thought you might be interested to hear how gold is mined and treated.

The miners go underground, and drill and blast the rock with their various machines. The rock, or ore, is hauled to the surface by huge 'skips' – trolleys running on railway lines. Giant crushers break up the ore which is then carried away on conveyer belts to the storage bins. Later, it is taken to the ball mills, where it is crushed to the fineness of flour. This frees the gold from the rock. The powder is then passed over special tables, where the lighter material is floated off by water, leaving the gold lodged on the tables. The lighter material is further treated in oil and water vats, where the very fine gold dust rises to the surface and is scooped off. The waste matter, which sometimes still contains a small percentage of gold, is then pumped away onto the slime dumps.

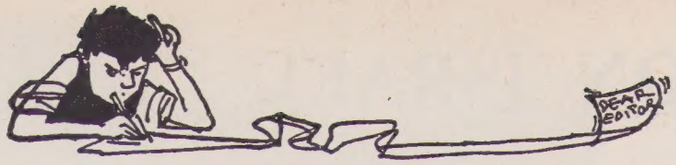
The gold is then taken to the furnaces and smelted to take out any impurities, before it is made into bars and sent to the government mint.

Gerard Sainsbury (*age* 13),
C.N.G.C.,
Norseman,
West Australia.

The Biggest Bang

DEAR EDITOR—The loudest noise ever heard on earth was made, not by an atomic or hydrogen bomb, but by a volcano. On 27th August 1883, more than eighteen centuries after Pompeii had been buried by the ashes of Vesuvius, the entire island of Krakatoa, in the East Indies, blew up with a deafening roar that could be heard for 3,000 miles. Stones, dust and ashes were hurled 17 miles into the air, and the eruption caused a 50-foot tidal wave which swept over the neighbouring islands and was still more than a foot high when it reached Cape Town, over 5,000 miles away. Vast clouds of dust spread into the upper atmosphere, filtering the sunlight and producing beautiful sunsets which were visible all over the world.

Christopher Warren,
63 *Trevale Road*,
Rochester, *Kent*.



Can you answer these?

Which word is the odd one out?

1. Width, length, depth, breadth, wealth.
2. Shilling, pound, penny, florin, half-crown.
3. Coal, gas, engine, oil, wood.

Fill the gaps. (A letter is added at each stage, but the order of letters is not changed:

4. Once, ..., pounce.
5. Have, haven, ...
6. . . . ., ..., stable. (Aim at six possible answers here.)

Change a letter at each stage, making a proper word every time:

7. BIRD
   B . . .
   B . . .
   . . . .
   CAGE

8. PAGE
   P . . .
   . . . K
   . . . .
   . . . .
   . . . .
   BOOK

9. If in a code FOOR stood for ROOF, what would be put for FLOOR in the same code?

ANSWERS

1. *Wealth (not a term of measurement).*
2. *Pound (it is a weight; it is also paper money).*
3. *Engine (not a fuel).*
4. *Ounce.*
5. *Heaven (or shaven).*
6. *The six possible answers are: able, table, able, sable; tale, table; sale, sable; stale, stale.*
7. *BARD, BARE, CARE.*
8. *There are several answers to this, e.g. PARE, PARK, PORK, CORK, COOK, or PACE, PACK, LACK, LOCK, LOOK.*
9. *ROOLF.*

BRAIN ? BOX

1. (1) A REAL DEW;
   (2) COOL ROAD;
   (3) HINDER LOADS;
   (4) MAIN STONE;
   (5) TAN SHOWING.

   These curious-looking expressions are anagrams of five American states. Can you get them?

2. In folk-lore, each month has its own flower or plant symbol. Here are the 12 flowers and plants given in alphabetical order. Write down the 12 months in calendar order and try to attach the appropriate flower or plant to each. You will find it is 'order of appearance' or association.

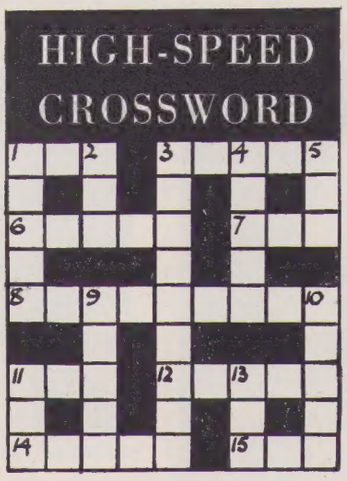
   Chrysanthemum; daisy; hawthorn; holly; honeysuckle; hops; morning glory; poppy; primrose; snowdrop; violet; water-lily.

3. How many dominoes are there in a set? Can you say (without making any written calculations) how this figure is reached?

ANSWERS

1. (1) DELAWARE; (2) COLORADO; (3) RHODE ISLAND; (4) MINNESOTA; (5) WASHINGTON.
2. January, snowdrop; February, primrose; March, violet; April, daisy; May, hawthorn; June, honeysuckle; July, water-lily; August, poppy; September, morning glory; October, hops; November, chrysanthemum; December, holly.
3. 28 – that is, the sum of 7, 6, 5, 4, 3, 2, and 1. There are 7 with 6 dots (including the six-blank); 6 with 5 dots (excluding the 6-5 already counted); 5 with 4 dots (excluding those already counted); and so on down to 1 with no dots (double blank).

HIGH-SPEED CROSSWORD



Clues Across

1. Coal mine (3).
3. Green place in the desert (5).
6. Way to Tipperary? (5).
7. One up for the batsman (3).
8. Lad to fetch and carry (6-3).
11. More than a mist (3).
12. Say (5).
14. Merits payment for work done (5).
15. This fish may be electric (3).

Clues Down

1. Flat piece of china or metal (5).
2. *The —— Gentlemen of Verona* (3).
3. Church players (9).
4. Bush (5).
5. Boy (3).
9. Pirates sailed under the 'Jolly ——' (5).
10. Peasant (5).
11. Opponent (3).
13. First woman (3).

Solution next week.

SOLUTION TO LAST WEEK'S CROSSWORD

ACROSS: 5, Armchairs; 6, The; 7, Rinse; 9, Stars; 10, Egg; 12, Acquiring.

DOWN: 1, Architect; 2, Ace; 3, Latin; 4, Press-gang; 8, Proud; 11, Era.

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Detail of the Madonna by Jacopo della Quercia (S. Petronius, Bologna)

determined. Even his face alone shows his energy and concentration. The youthful grace of St George shows that Donatello must have studied classical models for inspiration.

Like the great artists of Greece and Rome, the sculptors of the Italian Renaissance looked carefully at nature and tried to represent people and things as living images. They no longer wished just to make a story simple and easily understood, but strove instead to make it dramatically alive. This is clearly shown in the work of Jacopo della Quercia (1374–1438) from Siena, and of the great Florentine Ghiberti (1378–1455). It was the latter who won the competition for the decoration of a bronze door for the Baptistry at Florence, showing scenes from the Old Testament.

Detail from one of the bronze doors by Ghiberti (Baptistry, Florence) *called by Michelangelo 'The Gates of Paradise'*

Michelangelo

The 1500's (often known by the Italian name of *Cinquecento*, pronounced chinquaychento) were the years of the Italian High Renaissance. The greatest sculptor in this period of fine artists was the famous Michelangelo, who devoted most of his energies to the study of the human figure. Like his contemporary, Leonardo da Vinci, his research was not so much into the treatment of man in ancient works as into man himself; and by his careful studies of the human form he mastered the portrayal of figures in every aspect and position. The illustration on the right shows one of Michelangelo's early works, the Bruges *Madonna and Child*. Notice how the artist shows his reverence by the solemn attitudes he gives to both these figures.

Other very famous works by Michelangelo include *David*, *Moses*, and *The Two Slaves*, all of which show in different ways his mastery of the varied movements and attitudes of the human body.

The 17th century

During the period of the High Renaissance, certain rules derived from classical art had been firmly established. Inevitably, however, there followed a reaction, with artists prepared to break these rules and anxious to show off their original inventions. So the proportions of the human figure were sometimes distorted, with the intention of gaining an emotional effect, more dramatic and exciting. This emphasis on the emotions became one of the characteristics of the 17th-century movement called Baroque. Bernini (1598–1680) was the finest exponent of the Baroque style. He was a master of the representation of facial expression, and his works have a new intensity. Not only do his faces show a deep insight into character, but even the clothes in which he drapes his figures seem to writhe with movement instead of hanging in limp folds. These effects were heightened by his use of different materials.

The Madonna and Child by Michelangelo (Church of Our Lady, Bruges)

Bust of Francesco I d'Este by Bernini (Modena)

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18TH AND 19TH CENTURIES

Detail from Orpheus and Eurydice *by Canova (Correr Museum, Venice)*

The elaborate, theatrical effects of the Baroque style led in turn to a reaction from excessive decoration towards the restraint and simplicity that characterised classical art; and this renewed interest in the styles of antiquity was stimulated by the discovery of the Roman cities of Herculaneum and Pompeii.

Remains of ancient sculpture were easily accessible, and they were carefully studied by the artists of the late 18th and early 19th centuries. The most famous of these Neoclassical sculptors was Antonio Canova (1757–1822). He took many of his subjects from classical mythology – the illustration above is a detail from his *Orpheus and Eurydice*, who figure in a Greek myth. His treatment of the subject has also been greatly influenced by classical sculpture.

Modern sculpture

By the end of the 19th century, however, there were new developments. The French sculptor Auguste Rodin (1840–1917) drew his inspiration from Michelangelo, but he was also interested in the new ideas of the Impressionists of this time. He did not always 'finish off' his sculptures, preferring to give a feeling of spontaneity. The work of Rodin's Italian contemporary, Medardo Rosso, is also characterised by free handling and interest in capturing expression and movement.

This trend has been carried even further in the present century. Sculptors are no longer concerned simply to make a lifelike representation of their model: they aim instead to express their own emotions and reactions towards the object or person in question. They are often very much aware of the qualities of the material in which they are working, such as the grain of wood or the natural curves of a piece of stone.

Some modern works are entirely abstract, and do not represent anything specific. The spectator must not search for photographic representation, but appreciate beauty of line, texture, shape, and expression of feeling.

Head of a Laughing Woman *by Rosso* (1858–1928; Gallery of Modern Art, Venice)

Head of a Woman *by Rodin* (Luxembourg Museum, Paris)

Detail from Family Group *by Henry Moore* (bronze; Museum of Modern Art, New York)

Cow, *bronze by Arturo Martini* (1889–1947; Valli Collection, Florence)